



## Calliandra contour hedges Uganda - Orugo rwa Calliandra (Rukiga)

### Contour hedges of Calliandra planted on very steep slopes to combat soil erosion by decreasing surface runoff and increasing infiltration.

Calliandra Calothyrsus trees are closely planted along the contours on hilly and steep slopes to create natural and effective barriers for reduction of the surface runoff and retention of eroded sediment. Calliandra hedge barriers are a fairly cheap, effective, and sustainable way of controlling soil erosion and landslides on vulnerable steep slopes, especially where trash lines and Napier grass strips were inadequate to mitigate dispersed and concentrated soil and water runoff. Once established, the living barrier is durable with minimal additional maintenance cost to the farmer apart from pruning. The average length of a hedgerow is 50 to 70 m, corresponding to the width of a single terrace. The height varies according to intended use of the mature shoots. To use the stems as stakes, the hedgerow is allowed to reach a height of 4 to 6 m at maturity while a height of 1 to 2 m is sufficient for harvesting foliage as livestock fodder. The hedge barrier reaches its mature, maintenance level after 12 to 18 months.

The main purpose of the Calliandra hedge barrier is to reduce soil and water runoff. Calliandra is a leguminous shrub with deep roots that provides additional benefits such as soil stabilization and soil fertility improvement through nitrogen fixing. Calliandra is a source of fodder and its flowers attract bees.

At the beginning of the rainy season, calliandra seedlings are transplanted from the nursery (0.2m to 0.3m height) and planted in a row (0.3m spacing). In the early stages, gap-filling with more seedlings may be necessary as some fail to get established. A mixture of top soil and manure is applied in the spaces between the seedlings and watering is done to improve the seedling survival rate. The distance between rows is 10 to 15 m and depends on the gradient of the slope. Establishment of hedges starts with construction of an earth banked terrace, creating a trench at the lower end of the terrace. Calliandra seedlings are planted on the higher side of the trench. Measuring off 10 m lengths upwards into the terrace, other rows of Calliandra seedlings are planted along the contour in order to achieve the inter-row spacing. Establishment is manual labor intensive and therefore the community, organized as Farmer Field Schools, participates in the planting, one field at a time. Simple tools such as hand hoes, sokajembe (pick-axe) and shovels are used. Maintenance is achieved by weeding, mulching and cutting back. For it to establish well, Calliandra needs to be weeded to minimize competition with weeds for water and nutrients. The weeds also harbour pests. It may also be necessary to mulch the area around each seedling during the dry season. Where mulching is done, the mulch is placed at least 0.05m away from the plant to reduce pest attacks. Calliandra calothyrsus trees are cut back at a height of 2m to between 0.15m and 1m to improve foliage which is used as fodder for livestock. The hedge is then maintained at a height of 1 to 6 m depending on the intended additional uses. The branches removed can be used as fuel wood or stakes, while leaves can be used as fodder.

The hedge barrier may be attacked by pests. Scales are white, powdery insects that attack Calliandra stems. Scales can be controlled using washing detergents such as 'Omo' dissolved in water and sprinkled on affected plants using leafy branches or a knapsack sprayer. Black ants can seriously damage trees. They can be controlled by spraying. Other likely pests are crickets and grass hoppers which affect seedlings in nurseries, and Armillaria mellea, a fungus that attacks roots of Calliandra plant causing root rot and eventual death. Affected plants are uprooted and burnt. In addition, calliandra is affected by hot, dry weather. During the hot, dry weather, the hedge barrier becomes weak. However during the wet season it sprouts again, and, if well managed, becomes healthy again. A well-maintained hedge barriers can last well over 20 years.

**left:** Calliandra hedgerow protecting soil by reducing runoff on a steep (35% to 60%) slope (Photo: Charles L Malingu)

**right:** This technology is often supplemented with mulching, grass strips and agroforestry (Photo: Charles L Malingu)

**Location:** Uganda

**Region:** Kabale District

**Technology area:** 0.03 km<sup>2</sup>

**Conservation measure:** vegetative

**Stage of intervention:** mitigation / reduction of land degradation

**Origin:** Developed externally / introduced through project, recent (<10 years ago)

**Land use type:**

**Cropland:** Annual cropping

**Grazing land:** Intensive grazing/ fodder production

**Climate:** subhumid, tropics

**WOCAT database reference:**

T\_UGA013en

**Related approach:** Farmer Field School ( )

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## Classification

### Land use problems:

- The slopes are steep >30% to very steep >60%), with very high precipitation (>1440 mm). Severe surface erosion and landslides may occur at the beginning of the rains, before sufficient vegetation covers the soil. Continuous cultivation with little external inputs and nutrient transfer affects negatively soil fertility and in results reduces crops growth/vegetation cover, leading to erosion on steep slopes. (expert's point of view)

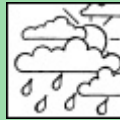
Floods are common in the valleys over the past ten years. (land user's point of view)

### Land use



Annual cropping  
Intensive grazing/ fodder production  
rainfed  
intensive grazing land  
rainfed

### Climate



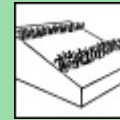
subhumid

### Degradation



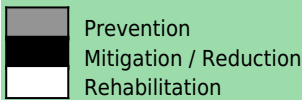
Soil erosion by water: loss of topsoil / surface erosion, mass movements / landslides

### Conservation measure

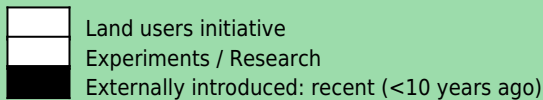


vegetative: Tree and shrub cover

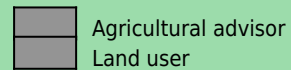
### Stage of intervention



### Origin



### Level of technical knowledge



### Main causes of land degradation:

Direct causes - Human induced: soil management

Direct causes - Natural: Heavy / extreme rainfall (intensity/amounts), other natural causes, steep slopes (extreme topography)

Indirect causes: population pressure, poverty / wealth

### Main technical functions:

- control of dispersed runoff: impede / retard
- control of concentrated runoff: impede / retard
- improvement of ground cover
- improvement of topsoil structure (compaction)
- stabilisation of soil (eg by tree roots against land slides)
- increase in nutrient availability (supply, recycling,...)

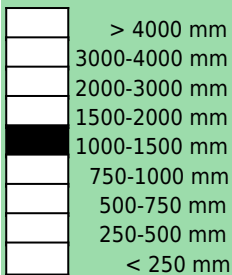
### Secondary technical functions:

- control of raindrop splash
- increase of infiltration
- increase of groundwater level / recharge of groundwater
- sediment retention / trapping, sediment harvesting
- increase of biomass (quantity)

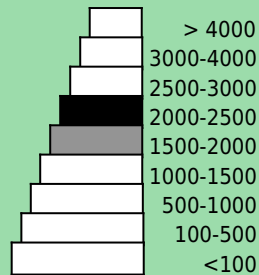
## Environment

### Natural Environment

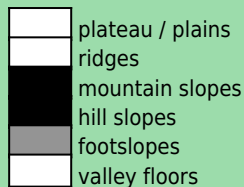
#### Average annual rainfall (mm)



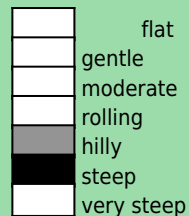
#### Altitude (m a.s.l.)



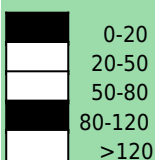
#### Landform



#### Slope (%)



#### Soil depth (cm)



**Growing season(s):** 120 days (February to May), 90 days (September to November)

**Soil texture:** coarse / light (sandy), medium (loam)

**Soil fertility:** medium

**Topsoil organic matter:** medium (1-3%), low (<1%)

**Soil drainage/infiltration:** good, medium

**Soil water storage capacity:** high

**Ground water table:** > 50 m

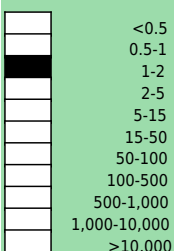
**Availability of surface water:** poor / none

**Biodiversity:** low

**Tolerant of climatic extremes:** temperature increase, seasonal rainfall increase, seasonal rainfall decrease, heavy rainfall events (intensities and amount), floods, droughts / dry spells

### Human Environment

#### Cropland per household (ha)



**Land user:** Individual / household, Small scale land users, common / average land users, men and women

**Population density:** 200-500 persons/km<sup>2</sup>

**Annual population growth:** 2% - 3%

**Land ownership:** individual, not titled

**Land use rights:** individual

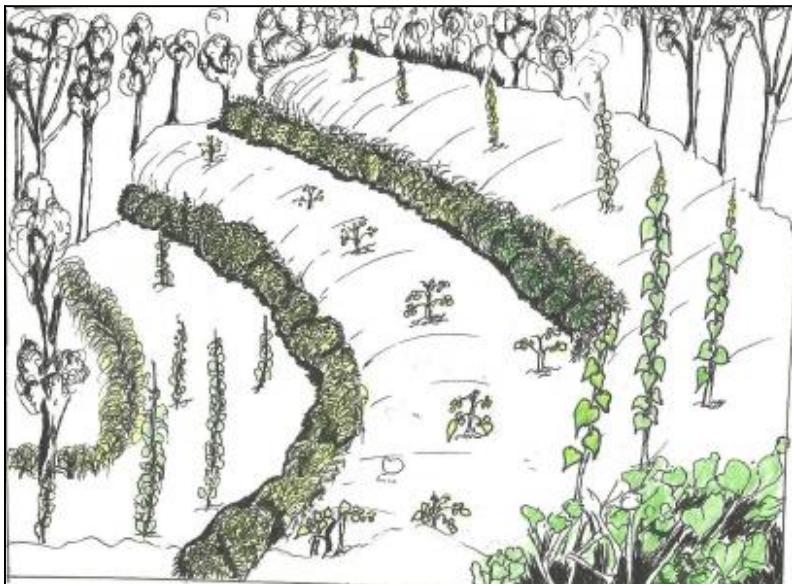
(The land belongs to an individual with no title but has all the rights over it.)

**Relative level of wealth:** poor, which represents 45% of the land users; 20% of the total area is owned by poor land users

**Importance of off-farm income:** less than 10% of all income: Crop and animal production greatly increased for land users implementing conservation measures, compared to those who do not implement.

**Access to service and infrastructure:** moderate: health, education, energy; high: technical assistance, market, roads & transport, drinking water and sanitation, financial services

**Market orientation:** mixed (subsistence and commercial)



### Technical drawing

Calliandra trees are planted in rows along the contour. Cutting back is done between 12 and 18 months to a height of 0.5 m. The trees are allowed to grow to between 1 and 6 m and the hedge is maintained at that height. Gap-filling, weeding and trimming are critical for a productive hedge. (Byonabye, Prossy)

## Implementation activities, inputs and costs

### Establishment activities

- 
- Establishment of Calliandra nursery
- Plantation of Calliandra seedling on the higher side of the trench
- Weeding

### Establishment inputs and costs per ha

Inputs	Costs (US\$)	% met by land user
Labour	44.60	100%
Equipment		
- tools	16.20	100%
Agricultural		
- seeds	9.60	100%
- seedlings	30.40	100%
<b>TOTAL</b>	<b>100.80</b>	<b>100.00%</b>

### Maintenance/recurrent activities

- Pruning and trimming the hedge barriers

### Maintenance/recurrent inputs and costs per ha per year

Inputs	Costs (US\$)	% met by land user
Labour	20.80	100%
Equipment		
- tools	16.20	100%
Agricultural		
- seeds	0.00	100%
- seedlings	1.00	100%
<b>TOTAL</b>	<b>38.00</b>	<b>100.00%</b>

### Remarks:

The cost of seedlings (0.20 US\$ each) and their transport up along steep slopes are the key factors affecting costs and hindering spontaneous adoption of the technology. Otherwise, the technology is acceptable to farmers as benefits are easily visible in the short run.

The cost assesment above refers to steep slopes.

## Assessment

## Impacts of the Technology

### Production and socio-economic benefits

- +++ increased crop yield
- +++ increased fodder quality
- +++ increased animal production
- +++ increased farm income

### Production and socio-economic disadvantages

- + loss of land
- + increased pests

### Socio-cultural benefits

- +++ conflict mitigation
- ++ improved conservation / erosion knowledge
- ++ improved food security / self sufficiency

### Socio-cultural disadvantages

### Ecological benefits

- +++ reduced hazard towards adverse events
- ++ reduced surface runoff
- ++ improved soil cover
- ++ increased biomass above ground C
- ++ reduced soil loss
- + increased nutrient cycling recharge
- + increased plant diversity

### Ecological disadvantages

### Off-site benefits

- +++ reduced damage on neighbours fields
- +++ reduced damage on public / private infrastructure
- + reduced downstream flooding
- + reduced downstream siltation

### Off-site disadvantages

### Contribution to human well-being / livelihoods

- +++ This technology helps to generate higher incomes which allow farmers to cover education cost of their children.

## Benefits /costs according to land user

### Benefits compared with costs

#### Establishment

#### Maintenance / recurrent

### short-term:

negative

negative

### long-term:

very positive

positive

Benefits are high compared to establishment and maintenance cost

### Acceptance / adoption:

88% of land user families (45 families; 90% of area) have implemented the technology with external material support.

12% of land user families (6 families; 10% of area) have implemented the technology voluntary.

There is moderate trend towards (growing) spontaneous adoption of the technology. The technology is appreciated by most farmers but adoption is limited by cost of seedlings and transportation up steep slopes

## Concluding statements

Strengths and → how to sustain/improve	Weaknesses and → how to overcome
It is easy to establish and maintain → Promote education campaign and spread information	The hedge barrier is ineffective before 12 months → Combine with trash lines before establishment
It has helped to increase crop and animal production → By proper management and not overgrazing animals	Technology harbors nesting birds → Ensure regular trimming of Calliandra to reasonable height and use scarecrows
Stabilize the soil and strengthening resistance to intensive rainfall and fast runoff → Promote technology through increased community mobilization	Needs at least 2 seasons to establish → Apply manure and water to the seedlings to ensure accelerated growth
Very effective to reduce soil erosion → Combine with other practices e.g. mulching	May reduce the amount of sunlight available to young crops if left untrimmed → Trim regularly
Calliandra binds the soil, thus reduces landslides. → It should be maintained through proper management	Extra cost in protecting from damage by livestock → Inter-crop with other fodder species to act as alternative fodder for livestock
Adds scenic beauty on a plot → By regular trimming	
Calliandra is good and attractive to bees → Leave every second or third row to flower	



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